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COWPEAS.

BY

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., January 19, 1899.

SIR: I have the honor to transmit herewith, for publication as a Farmers' Bulletin, a paper by Mr. Jared G. Smith, assistant agrostologist, entitled Cowpeas.

The necessity for the more extended cultivation of grasses and forage plants in the Southern States is very great. The Southern farmer must not confine himself to the growing of cotton, cane, or tobacco, but should adopt modern methods of diversified farming. There must be pasture lands and hay meadows on every farm in order to feed the cattle, sheep, and swine, the purchase of which in the form of meat products now consumes the profits from the cash crops of cotton, rice, cane, and tobacco. There is no better forage plant or soil renovator than the cowpea, in some of its numerous varieties, because of its adaptability to the wide range of soils and conditions.

Respectfully,

F. LAMSON-SCRIBNER,
Agrostologist.

Hon. JAMES WILSON,
Secretary of Agriculture.

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FIG. 1. Leaf and pods of the cowpea (*Vigna catjang*) 6

COWPEAS.

INTRODUCTION.

Thousands of tons of hay from the Northern and Western States are each year marketed in the South. Many of the Southern farmers and planters still hold to the methods of thirty years ago, growing a main crop of cotton, cane, or tobacco, and buying meat products and forage instead of producing these on the home estate. This is no longer profitable because of the low prices to which the staple crops have fallen, and there is no valid excuse for the continuance of this practice. The South has as great an abundance of grasses and leguminous forage plants as any other section. While red clover and timothy can not be depended on, there are other hay crops just as reliable for the South as these excellent grasses are for the North. There is perhaps greater need for the cultivation of leguminous crops in the South than in the North. The soils are more liable to the rapid exhaustion of the available plant foods, because the leaching of soluble salts goes on all the year. Following the prodigal methods of the past, the farmer depends on annual applications of commercial fertilizers to repair the waste. Soils can be most profitably built up by increasing the amount of organic matter in them, and the quickest and cheapest way of doing this is by growing leguminous forage crops and feeding them on the estate, returning all the manure to the land. Alfalfa, cowpeas, velvet bean, Florida beggar-weed, melilotus, Japan clover, and winter and hairy vetches may all be grown. These forage crops supplemented by cotton-seed meal and hulls will provide the best forage for work stock, cattle, sheep, and swine, enriching the plantations and the planter, adding nitrogen and humus to the soil, replacing the more expensive commercial fertilizers and providing hay as good as any that can be bought in any market.

THE COWPEA.

The cowpea (fig. 1) is to the South what alfalfa is to the West and red clover to the North—a forage plant well adapted to the needs of the region. The cowpea has been cultivated in the South for at least one hundred and fifty years. It was probably first introduced on plan-

tations in South Carolina, the seed having been brought from India or China. From this original introduction and from subsequent importations its cultivation has spread to almost every farm and plantation in the Southern States.

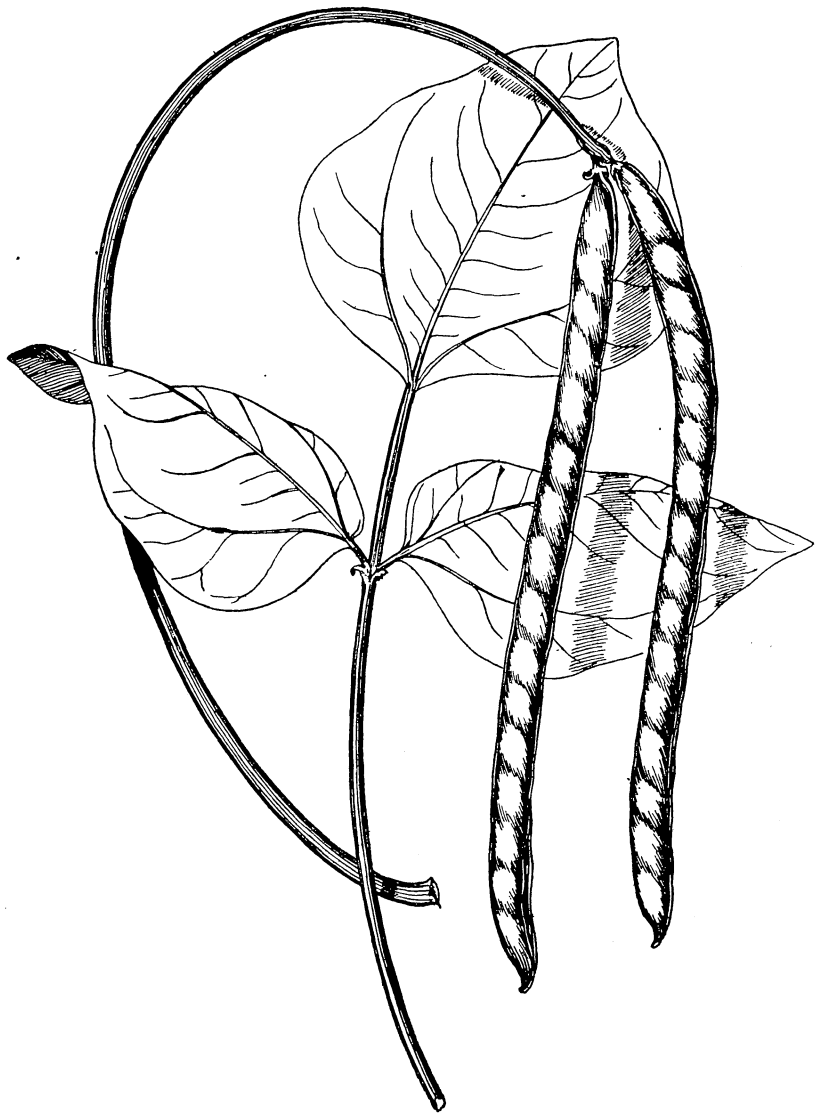

FIG. 1.—Leaf and pods of the cowpea (*Vigna catjang*).

Cowpeas are in their relationship and habit of growth really beans and not peas, as the name would indicate. They are annuals, belonging to the genus Vigna, the members of which are largely represented in South Africa, and are closely related to the lablab, lima, and haricot

beans of our gardens, as well as to numerous cultivated or half-wild garden sorts common in tropical Asia and America, but little known to us.

VARIETIES.

There are a very large number of named varieties of this forage plant. New forms are constantly arising, due to variations in the habit of growth, color of leaf, stem, and pod, and the shape and color of the seed. Variations from any chosen type are constantly appearing, and as one or another of these sports or forms gains sufficient local reputation a new name is applied, and sooner or later the supposed new variety is placed upon the market. In this way one variety of cowpea may be cultivated in a dozen different localities under as many names, or a dozen different peas may bear the same name.

Cowpeas occur in every gradation of habit, from a compact, stocky, upright bush having single stems a foot high with very short lateral branches, to those with trailing runners growing as flat upon the ground as sweet-potato or melon vines, the prostrate stems 15 to 20 feet in length. The pods vary from 4 to 16 inches in length, and the peas are of every imaginable shade of white, yellow, green, pink, gray, brown, red, purple, and black, of solid colors or variously mottled and speckled, and of varying sizes and forms, from large kidney-shaped to little round ones smaller than the garden pea. There is a like variation in the length of time the different forms require to ripen seed, some requiring eight or nine months, a few ripening in sixty days from the time of planting.

There seems to be a somewhat constant relation between the time required for attaining maturity and the habit of growth. The bush varieties ripen in a shorter season than the trailers, but a bush variety taken from Tennessee or Virginia will, in the course of a few seasons, assume the trailing habit, and lengthen out its period of growth, when removed to the Gulf States. Also, a runner or creeper requiring six to eight months for reaching maturity in Louisiana will, if planted each year a hundred miles farther north, gradually accommodate itself to the shorter season and at the same time shorten its runners, approaching more and more to the upright or "bush" habit of growth. No definite line of separation can be drawn between bush peas, trailers, and runners. The best varietal character is probably the color of the seed. It is quite probable that more than one species is in cultivation. The "red" and "black" varieties are closely allied; the round "lady" peas form a separate group; the large "black-eyed" and "purple-eyed" are typical of another, and the variously mottled and speckled "whip-poor-wills" are only a degree removed from the solid-colored yellow, pinkish, and light-brown ones, and together would naturally be taken to constitute one species or variety. The black peas pass through various shades of red before maturity. The red varieties sometimes carry their change of color in ripening so far that they can not be distinguished

from the black. The "black-eye" and "purple-eye" are of the same ground color, differing only in the color of the ring surrounding the eye. The various "crowders," yellow and white, the whip-poor-will, clay, and "yellow-eye" forms have numerous crosses and so-called hybrids in which the fundamental yellows and browns form varying mixtures.

COWPEAS AND SOIL RENOVATION.

A field of cowpeas has been very happily designated "the poor man's bank," for in common with all its leguminous congeners, the field pea, clovers, alfalfa, and a score of others, this crop increases the fertility of the soil upon which it grows. This fact has long been accepted by farmers and students of agriculture, but until recent discoveries in Germany and America it was believed that the chief function of these plants was to tap the subsoil reservoirs of nitrogen, bringing this valuable fertilizer to the surface by means of their long roots for the use and benefit of succeeding crops.

But within the last decade scientific workers have discovered that minute micro-organisms, or bacteria, which live within the tissues of the roots of leguminous plants, take up free nitrogen from the gases in the soil, just as the higher plants and animals utilize the oxygen of the air. This nitrogen enters into combination to form nitric acid, which unites with the mineral elements of the soil to form nitrates, a kind of plant food exceedingly valuable to the growing crop. Nitrogen, when in combination with other elements, is an indispensable form of plant and animal food, but the free element can not be utilized, uncombined, by any of the higher organisms. Small amounts of nitrous acid are formed in the air by lightning discharges, and are in part absorbed by the soil and in part carried by rivers and drainage waters into the sea. Free nitrogen exists only in the air and in the gases of the soil, but as ammonia, nitrous and nitric acid, nitrites and nitrates, it is present in varying quantities in the soil, the unbroken rocks, and the waters of continents and oceans.

The most available purchasable nitrogen is obtained from nitrate of soda or from some form of animal wastes, such as freshly ground bone, dried blood, guano, tankage, and fish scrap, and from cotton-seed meal and other like by-products of the oil mills. These fertilizers are all expensive, so much so that they can be profitably employed by the farmer only in intensive farming with specialized crops. The gain in yield with low-priced crops, such as corn, cotton, tobacco, cowpeas, and the grasses, using high-grade and costly fertilizers, is not commensurate with the additional expense. But every farmer, rich and poor, has over three thousand tons of atmospheric nitrogen resting on every acre of his farm, a certain quantity of which can be transformed into available plant food every time that he grows a crop of cowpeas, red clover, or alfalfa.

There are a great many acres of farming land in the South in need of renovation. The red uplands and yellow-clay soils were undoubtedly less fertile originally than the alluvial and black prairie soils, and the methods of cultivation which formerly prevailed have still further diminished their productiveness. In the days when every plantation numbered its acres by the thousand, and labor was cheap, the planter could afford to clear off the native forest growth and bring fresh fields into cultivation whenever the yields of cotton and tobacco fell below what was considered a profitable figure. The old field, stripped in a few years of its accumulated store of fertility, was abandoned and allowed to grow up to weeds and underbrush. The forest again spread across it, and gradually, in the slow course of half a lifetime, the natural enrichment of its surface soil by the growth of the woodland grasses made it ready for another cultivation.

But with the breaking up of the large estates and the abrupt change in the labor conditions this method of farming became no longer profitable or even possible. A planter with fewer acres could no longer afford to await nature's slow process of rejuvenating the soil. A new system of farming was necessary. The land must not be allowed to "go back." It must be kept up to the highest state of productiveness by a rotation of crops, a judicious use of commercial fertilizers, the growth of nitrogen-fixing leguminous crops, and good and thorough cultivation. To maintain the fertility of any soil the amount of humus or decaying organic matter in it must be maintained. Take two soils of as nearly as possible the same physical and geological formation, but the one rich in humus and the other lacking it, and fertilize them with equal quantities of commercial manures; the one which has the most organic matter in its composition will yield the larger crop. The soil on that field will stand drought better, will wash less under torrential rains, and be more friable and of better tilth. The average soils of the South need more humus. It can be best supplied by sowing more grass, more permanent pasture lands, more leguminous crops. In a word, plant cowpeas.

COWPEAS FOR FORAGE.

There is no forage plant better adapted to the needs and conditions of Southern agriculture than this rank, free-growing annual. It will thrive luxuriantly upon the rich, swampy, cane lands of Louisiana. On the driest and most sterile worn-out uplands it serves the admirable purpose of supplying a larger quantity and better quality of forage than any other bean or clover. And whenever a crop of cowpeas has been taken off a field the surface soil is left richer by a good many pounds of that most costly of all plant foods, nitrogen. The roots of the cowpea enter deeply into the soil, opening and loosening it far down for the benefit of the roots of the succeeding crops of corn, cotton, and tobacco. It has been found by experiment that the ferti-

lizing value of the roots and stubble of the cowpea are very considerable, but not as great as that of the hay removed from the field. The best and most economical use of this forage crop is, then, to cut for hay, feed to stock, and return the stable manure to the soil. Plowing the whole crop under is less remunerative, because there is much needless waste of the muscle-making and fat-forming constituents of the plant which would bring more profit if turned into beef, pork, wool, cheese, or butter.

As regards the disposal of the crop, there is a wide variation in practice. The feeding value of vines and peas much exceeds their fertilizing value. But as between the practice of turning the vines under green in autumn and that of allowing them to lie on the ground during the winter, the latter is undoubtedly sometimes to be preferred, though theoretically wrong. Theoretically, to plow the vines under in autumn will be to save all the available nitrogen and convert the whole plant into humus. Practically, the turning under of so large an amount of watery green herbage is sometimes highly injurious, causing a too rapid decay and consequent "burning" or souring of the soil. The upper soil layers, freshly stirred and mellowed in autumn, lose more by leaching and washing than do those of an unplowed field covered by its winter mulch of decaying herbage, though in both cases there is a decided loss of fertility over what would result by following the peas with a crop of rye, winter wheat, the turf-forming winter oats, winter vetch, or crimson clover. The yields of forage are better on rich soils than on poor ones, but the beneficial effects upon the succeeding crop due to the growth of the cowpea are not so marked in the former case as in the latter.

METHODS OF CULTIVATION AND HARVESTING.

Cowpeas are planted broadcast or in drills, very commonly between the corn rows after the crop is laid by. The amount of seed used varies from 4 quarts to 2 bushels per acre, the average amount being, perhaps, about 3 pecks. If sown in drills, 18 to 30 inches apart, less seed is required than when sown broadcast. The seed will stand being covered to the depth of 2 or 3 inches, but care must be taken to plant when the ground is neither too wet nor too cold, as the peas rot very rapidly under such circumstances. In regard to excess of moisture cowpeas behave like beans, and in the early stages delight in a warm, mellow seed bed. Much of the failure that has attended the attempted introduction of cowpeas into the Northern States is due to planting before the ground is warm enough. It must be remembered that this plant originated in the Tropics and that when transplanted to higher latitudes it makes its best growth in the hottest weather. It is even more susceptible to cold and wet than is corn. Hence, proper delay in planting will permit economy in the use of seed. Where the vines are

grown for hay, the yield will be larger if the seed is planted in drills and cultivated a time or two. The yield of peas is also larger when only a moderate amount of seed is sown and the vines have more space and light and air between them. It is also heavier from late-planted vines than from the very early ones. In tests to determine the relative value of different named varieties it has been found that, as a rule, those which make the heaviest yields of vines also bear large crops of peas.

The vines should be mowed for hay when the peas are well formed and the leaves and pods are first beginning to turn yellow. After wilting on the ground or in windrows from twenty-four to forty-eight hours, the hay is placed in small, thin piles, or cocks, and allowed to cure for several days, when it may be carted to the barn or stacked under sheds. The haymaking process is a difficult one, requiring more care and attention than in the case of red clover, because the broad leaves and thick stems contain a larger amount of water. The hay must be placed in cocks before the leaves become brittle, and the piles must be small enough to allow free circulation of air to the center of each. Bright cowpea hay, clean and well cured, is worth as much as the best red-clover hay, and there is no good reason why the Southern farmers and planters should buy the Northern-grown article for their working stock or for fattening their cattle. Every ton of hay used on the farm should be grown there. Another method of curing hay is to stack the vines in a pen or rack of rails or poles so arranged as to allow the air to enter every part of the pile. This stacking over poles is best where the vines are pulled, or where the trailing and creeping sorts are used. The bush varieties are the best for hay, because of the greater ease with which they may be mowed and handled. They also hold their leaves better than the ranker trailing sorts. The yield of hay varies according to the fertility of the soil upon which it is raised, whether it is grown on rich lowlands or on the drier and more sterile uplands. In the Gulf States cowpeas will probably give an average yield of 2 to 3 tons per acre, while 4 to 6 tons are not uncommon. Farther north the average will range from 1½ tons in Ohio to 2½ tons in Arkansas, Missouri, and Tennessee. As with other crops, the time of planting, the character of the soil and of the cultivation, and the amount of rainfall have much to do with the yield. Along the Gulf it is one of the best hay crops. North of the latitude of the Ohio River it is chiefly valuable as an addition to the list of drought-resistant, soiling crops and as a crop that will yield a considerable amount of forage on soil too sterile to grow red clover. The commercial value runs from $6 to $20 per ton, being governed by the relative abundance of other grades of hay and fodder. Its feeding value is equal to that of the best red clover, and the hay ranks high in palatability and digestibility.

COWPEAS FOR SWINE AND CATTLE.

When cowpeas are planted for green manure, it is an excellent practice to turn hogs into the field about the time that the first peas are ripening. Young pigs thrive amazingly on the succulent foliage and well-filled pods, and the quality of the pork raised on such a healthful and nutritious diet is very fine. This is a profitable method of fattening hogs or of preparing them for topping off with corn or sorghum for market. An acre of ripening cowpeas will pasture from fifteen to twenty hogs for several weeks, and the gain in fertility from the droppings of the animals during that period will more than counterbalance the fertilizing value of the forage eaten. The rapid increase in weight will thus represent so much clear profit, and the farmer is richer by half a ton or more of prime pork for every acre planted. Chickens and turkeys also eat the ripe peas and do well upon them. Cattle and horses are sometimes pastured on them, but the safer and more economical way of feeding the green cowpea vines to such stock is to cut or pull and feed partially wilted. There will be less waste and destruction from trampling, and if each animal is given only so much as it can eat clean, the greatest economy as well as greatest profit will result. Furthermore, cattle and sheep are liable to bloat if allowed to eat too ravenously of cowpea vines or any other rich and succulent forage, and by using it as a soiling crop the danger may be more readily controlled and the loss prevented. The report has been sent out from some of the Northern experiment stations, where this forage plant is not ordinarily cultivated, that cattle will not eat the green vines except after having been starved to it, and then only sparingly. We have seen Western horses and ponies that would not touch red clover or a grain ration of oats, and Eastern stock that would not eat alfalfa hay. But these few adverse cases do not prove that red clover, alfalfa, and oats are not good forage. With the cowpea the case is similar. It is very rarely that any Southern planter reports that this forage is refused by any kind of stock.

COWPEAS FOR SILAGE.

Reports are very conflicting in regard to the value of this crop for silage. There is much positive testimony both for and against, some authorities stating that the quality is excellent and others that the vines contain too much water, the product of the fermentation being a slimy, foul-smelling mass, unfit for food for any kind of animals. From reports on the subject it is to be believed that the attempt to convert cowpea vines into good silage can not be made with such uniform success as in the case of red clover. The percentage of water in the tissues is too high, and the mechanical difficulties in the way of running a mass of tangled herbage through the feed cutter are too great. Special machinery would have to be constructed for the pur-

pose. Indian corn will probably remain for many years the best all-round forage plant for this purpose. The consensus of opinion among agricultural workers seems to be that ensilage made from any legume, whether it be cowpeas, vetches, soja beans, alfalfa, or the clovers, does not equal in feeding value good hay made from the same. Under certain conditions that arise in the silo the crude protein is converted into indigestible or insoluble nitrogenous compounds, but the losses from this cause are perhaps no greater than those that result from the careless handling of the hay in the field, stable, and feeding pen. Good cowpea or clover silage is valuable, but either corn or sorghum is far superior to it.

HARVESTING THE SEED.

The majority of farmers harvest only enough seed of cowpeas to plant again the next season. The ripe pods are picked by hand and are stored in barrels until needed or are thrashed out by machine or with flails on the barn floor during the winter. Sometimes, if the crop is heavy enough to render it profitable, the vines are run through an ordinary thrashing machine from which the concaves and alternate teeth of the cylinder have been removed. But a machine breaks and bruises more of the seed than when the pods are first picked off by hand. Fully 95 per cent of the seed placed upon the market is hand picked. The yield per acre varies according to the variety and the method of cultivation. Eight to 12 bushels is a fair average of the amount that can be obtained when the peas are planted in the corn rows. Sown alone, broadcast or in drills, yields of from 20 to 35 and even, in rare cases, 50 bushels are obtained. The Black, Unknown, Red Ripper, Clay, and Calico varieties are all heavy seed bearers. Lady and White Crowder are good for table use and also yield well. The Black-eye, Red Crowder, and Whip-poor-will, or Speckled, are very widely cultivated and find ready sale. Those which make the largest growth of vines for green manure, as a winter soil mulch, for hay or soiling are the Unknown, Red Ripper, Southdown, and Clay. Whip-poor-will, Black-eye, White, and Red Crowder ripen in from twelve to fourteen weeks, and hence are adapted to cultivation farther north than the very late, but ranker growing, Unknown, Wonderful, Red Ripper, Black, and Gourd varieties. The New Era and Lee ripen seed in from six to eight weeks, and hence are the ones to recommend for summer-soiling crops in the upper prairie region of the Mississippi Valley or anywhere else that an early maturing cowpea is required. This is one of the species of cultivated plants which is very readily modified by change of habitat. Early and late maturing forms may be found of every strain that has been in cultivation for any considerable time.

THE FEEDING VALUE OF COWPEAS.

The feeding value of cowpea hay is very high, as shown by feeding tests and chemical analyses. Berckmans states that the well-cured hay is more nutritious than any hay produced from grass, millet, or any other plant used for the purpose, and that one ton of it will last as long as a ton and a half of the best timothy. One hundred pounds of the green vines contain 20.4 pounds of total dry matter, of which 10 pounds are digestible. One hundred pounds of the hay contain 89.3 pounds of the total dry matter, of which 50.7 pounds are digestible. The digestible crude protein in the hay amounts to 10.79 pounds in comparison with 10.58 for alfalfa, 10.49 for crimson clover, 6.58 for red clover, and 2.89 for timothy. The digestible carbohydrates and fat amount to 39.91 pounds in every 100 pounds of cowpea hay, 38.71 for alfalfa, 39.42 for crimson clover, 37.01 for red clover, and 45.15 for timothy. The average nutritive ratio* of cowpea hay is 1:3.9; of alfalfa, 1:3.8; of crimson clover, 1:3.9; of red clover, 1:5.9; and of timothy, 1:16.2. The green cowpea vines are more succulent than red clover or any of the grasses, containing less dry matter per total weight.

The feeding value of the hay is shown by the nutritive ratio which represents the relation of the digestible crude protein to the carbohydrates and extract matter. Thus, for every pound of digestible crude protein in cowpea hay there are 3.9 pounds of digestible carbohydrates and fat. In order to insure uniform growth of an animal and get the full feeding value of all the constituents of a forage, the ration must be properly balanced. The nutritive ratio of cowpea hay is narrower than can be properly utilized by the animal, and to get the full benefit of all the crude protein in the plant, hay or coarse fodder containing an excess of the carbohydrates must be added to the daily ration. A practical farmer, writing from southern Mississippi, says that excellent results were obtained through feeding two parts of cowpea hay to one part of crab grass or timothy, and when using this ration very little grain was required, especially when the hay contained much of the pods. If cowpea hay be fed without the admixture of some coarse forage or grass hay, a portion of the protein will be wasted through inability of the animal to digest and assimilate the whole amount. Cowpea hay is used on many of the Southern sugar and rice plantations for the horses and mules, and it is found that work stock keep in excellent condition upon it, requiring very little grain.

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* The numerical relation which the protein of a feed bears to the carbohydrates (and fat reduced to carbohydrates) is termed its nutritive ratio. Fat is multiplied by 2¼ to convert it into carbohydrates. If a ton of feed should contain 96 pounds of digestible protein and 928 pounds of digestible carbohydrates, it would have 9.6 times as much carbohydrates as protein, or 1:9.6, which is its nutritive ratio.—J. B. LINDSEY.

FERTILIZERS.

It has been found that, as a rule, it does not pay to use high-grade commercial fertilizers on cowpeas; this, however, depends a good deal on the soil and on what crop is to follow. It is usually unprofitable to fertilize with expensive nitrogen, in the form either of nitrate of soda or of guano, and even the organic nitrogen of cotton-seed meal does not act upon this crop as rapidly as upon cotton and the cereals. The nitrogen of the fertilizers seems not to influence the percentage of protein in the crop, and the general opinion of agriculturists in the South is that it does not cause a sufficient increase in yield of vines to pay the cost. At the Delaware Station 160 pounds of muriate of potash per acre doubled the yield of vines, and superphosphate produced no effect. At the Georgia Station combinations of superphosphate and potash gave the best results, but later experiments there indicated that large amounts of potash are unprofitable, and that superphosphate at the rate of from 200 to 400 pounds per acre gave better results. Superphosphates are very much preferable to untreated rock phosphate. The latter can be sold at lower rates, and it remains to be seen whether it would not be a profitable method to apply the soft phosphate to the cowpeas for the benefit of the succeeding crop in the rotation, for it has been found that the insoluble phosphoric acid of the untreated rock becomes changed to forms available as plant food in the presence of large amounts of decaying vegetable matter in the soil. If it is found that this process can be relied upon, then the cowpea will have another valuable quality added to it, namely, that of being able to change into high-grade and more costly superphosphate the low-grade and cheap but unavailable phosphoric acid of the untreated rock.

The chief functions of this crop, then, are to furnish large amounts of nitrogen abstracted from the air and fixed in the roots and stubble in a conveniently available form for the use of succeeding crops; second, to produce a large yield of vines and peas rich in digestible protein, which, either as hay or for soiling purposes, will take the place of concentrated nitrogenous foods; and, third, to supply humus, which acts directly and indirectly to produce fertility by breaking down and rendering available the basic minerals of the soil. The fertilizing value of the nitrogen in the vines is entirely dissipated or greatly diminished by weathering when they are left on the surface of the field during the winter. Hence, to secure the full value, the cowpeas should be fed and the stable manure returned to the field. If the vines are plowed under in autumn, a winter forage crop, such as winter oats, crimson clover, rye, or vetches, should be planted to prevent the leaching and washing action of the winter rains.

FARMERS' BULLETINS.

These bulletins are sent free of charge to any address upon application to the Secretary of Agriculture, Washington, D. C. Only the following are available for distribution:

No. 15. Some Destructive Potato Diseases: What They Are and How to Prevent Them. Pp. 8.
No. 16. Leguminous Plants for Green Manuring and for Feeding. Pp. 24.
No. 18. Forage Plants for the South. Pp. 30.
No. 19. Important Insecticides: Directions for Their Preparation and Use. Pp. 20.
No. 21. Barnyard Manure. Pp. 32.
No. 22. Feeding Farm Animals. Pp. 32.
No. 23. Foods: Nutritive Value and Cost. Pp. 32.
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No. 32. Silos and Silage. Pp. 31.
No. 33. Peach Growing for Market. Pp. 24.
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No. 36. Cotton Seed and Its Products. Pp. 16.
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No. 41. Fowls: Care and Feeding. Pp. 24.
No. 42. Facts About Milk. Pp. 29.
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No. 44. Commercial Fertilizers. Pp. 24.
No. 45. Some Insects Injurious to Stored Grain. Pp. 32.
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No. 51. Standard Varieties of Chickens. Pp. 48.
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No. 53. How to Grow Mushrooms. Pp. 20.
No. 54. Some Common Birds in Their Relation to Agriculture. Pp. 40.
No. 55. The Dairy Herd: Its Formation and Management. Pp. 24.
No. 56. Experiment Station Work—I. Pp. 30.
No. 57. Butter Making on the Farm. Pp. 15.
No. 58. The Soy Bean as a Forage Crop. Pp. 24.
No. 59. Bee Keeping. Pp. 32.
No. 60. Methods of Curing Tobacco. Pp. 16.
No. 61. Asparagus Culture. Pp. 40.
No. 62. Marketing Farm Produce. Pp. 28.
No. 63. Care of Milk on the Farm. Pp. 40.
No. 64. Ducks and Geese. Pp. 48.
No. 65. Experiment Station Work—II. Pp. 32.
No. 66. Meadows and Pastures. Pp. 24.
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